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West Baden Selected for 1928 Convention

WHEN the Board of Directors of the Association assembled at the Ambassador Hotel, Atlantic City, on July 29, for their semi-annual meeting, it became apparent shortly after Chairman Graves called the meeting to order that the task of selecting a meeting place for the 1928 convention was not to be an easy one. For many weeks preceding the Board meeting an influx of invitations were received from the leading cities of the country, each of which hoped to act as our host on the occasion of the Convention next January. Some appreciation of the care and thought given by the Board of Directors to the selection of the convention city will be had from the knowledge that this question was debated for over two hours before it was finally voted unanimously that the Eleventh

Annual Convention of the National Crushed Stone Association be held at the West Baden Springs Hotel, West Baden, Indiana, during the week following that of the Road Show. The latter is to be held in Cleveland on January 9-14, which consequently places the date of our Convention on January 16-19.

There were many factors contributing to the selection of West Baden, but probably outstanding among these are its excellent location, its attractive rates, and its very unusual facilities for handling the Manufacturers' Division Exposition, held in conjunction with our annual conventions.

Each successive year, since the establishment of the Manufacturers' Division Exposition as a feature of our annual meetings, has witnessed a very rapid



West Baden Springs Hotel, selected as Headquarters for 1928 Convention



Some of those in attendance at the Board of Directors Meeting at Atlantic City, N. J., July 29

growth both in the size of the individual exhibits and in the total number of exhibitors, until it has become increasingly difficult to find suitable headquarters for the Convention, where both the meetings and the Exposition can be held under the same roof.

The West Baden Springs Hotel is ideally arranged to meet our more or less exacting requirements, there being ample and spacious accommodations for the various meetings and group luncheons in addition to what probably represents the best adapted room for exposition purposes in the United States. This room, designated as the Atrium and located in the center of the hotel, is over two hundred feet in diameter and extends through six stories, a distance of one hundred and fifty feet to the roof. The roof which is glass enclosed, is of arch construction thus eliminating supporting columns which often make it difficult to obtain the best layout for the Exposition. Coupled with this, the fact that an unusually large entrance leads directly from the street level would seem to make exhibiting conditions ideal.

The Detroit Convention of the Association in 1927 contributed more in the nature of real value and en-

joyment than any of its predecessors and when it is also considered that all previous registration records were broken, Detroit set a mark which it will be difficult to surpass. With the assurance of the management of the West Baden Springs Hotel that nothing will be left undone which could contribute to our pleasure and comfort during our sojourn there and with such excellent convention facilities, it is confidently expected that with the whole-hearted cooperation of both active and associate members, it will be possible for President Graves to say at the closing luncheon of the Convention on Thursday, "bigger and better" than ever before.

Research Testing Laboratory Authorized

After selecting the convention city, the Board took up the question of the establishment in Washington, in conjunction with the Bureau of Engineering, of a research testing laboratory. It cannot help but be gratifying to the industry to know that the Board not only felt that such action was desirable but that it was an urgent necessity. It was consequently voted unani-

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Why a Testing Laboratory?

FOR ALMOST two years President Graves has persistently urged the importance of a testing laboratory as one of the means for carrying forward the constructive work in which our Association is engaged. To many of our members it may not be quite clear just how the crushed stone industry will be aided by having its own research facilities and it may be helpful if some of our ideas on this important matter were set forth.

Comparatively few give much thought to the startling progress being made in our country along almost all lines of endeavor. We read frequently of some new development which has eventuated in achievements, possible, hitherto, only in our realms of fancy. The wonderful developments with ex-rays and wireless transmission in its various phases, our startling progress in air transport and in the various machines and devices for navigation which have made long distance flights possible, the creation of artificial silk, the present high efficiency of steam-electric power plants and our mass production methods are but a few examples of numerous recent achievements of tremendous import.

These things did not just happen. They had back of them the tireless research and thought of hundreds of individuals in the laboratory and plant, field and office and that same process is going on at a tremendous rate today in almost all industries. Someone may even soon release the energy of the atom for practical use. One discovery may revolutionize an industry overnight and incidentally may send some industries to the scrap heap or force them to other fields. Any manufacturer is liable to an unpleasant surprise at almost any moment. These surprises, however, are in the making a long time before they finally happen and invariably, to a wide awake industry, ample time is available to determine what had best be done to meet a developing emergency.

Preparing against a possible crisis is merely a case of gaining knowledge of the facts which are apt to create the emergency and developing and assembling those facts which can be used to circumvent it. Forewarned is indeed fore-armed. What better way of fore-arming can there be than to develop the critical facts in connection with an industry to the end that its usefulness may be developed, its processes rendered more efficient and new uses for its products discovered? How can these things best be accomplished without

continuous thought, and research, not by others, but by ourselves who are most interested?

The progress of most huge industries is directly traceable to the research effort they have put into their work. The electrical, air-craft and automotive industries are all notable examples of great developments made as the result of research. Coming closer to our own field, the Portland cement industry is still another which has seen the value of investigational work. Yet the total value of their output does not much exceed ours. Certainly it seems reasonable that those industries which do not keep up with the rapid progress of their neighbors are soon going to find themselves out-distanced and embarrassed from sheer lack of knowledge which they should have and there is no more effective way of gaining that knowledge and doing the necessary development work than in our own research laboratory.

Specifically the following are some of the reasons why we should possess our own research facilities in addition to availing ourselves of facilities which are offered in other laboratories.

1. There are many problems in which we alone have a primary interest and in which we cannot ask any disinterested laboratory to engage. Among problems of this nature are developing new uses for our products, such as stone screenings, a critical study of stone dust, studies to increase the yield of stone concrete, critical studies of new theories for proportioning concrete, particularly in their effect on stone concrete and numerous other problems.
2. With a laboratory of our own we shall not be placed in the very undesirable position of having to obtain much needed information in a circuitous manner and often of not being able to obtain it at all.
3. We would be able to initiate investigations and carry them on to the extent of gaining confidence in asking others to carry them further for their own benefit as well as for ours.
4. Information now buried in the files of other institutes will be brought to light as we obtain similar information and thus much more data will become available than would otherwise be the case.

5. Original investigation in our own laboratory will permit the writing of original, technical papers and thus not only will much prestige for the industry be made possible but this will also have considerable advertising value because of the resulting discussions.
6. Research facilities should gradually aid in increasing the membership in the association whose usefulness and value will thus be extended to the benefit of the entire industry.

Briefly then a research laboratory is a safeguard against the element of surprise and an essential means for our necessary development. In it creative work could be done, often not possible in any other way.

A COMMENT ON THE WATER-RATIO SPECIFICATION

WHEN Mr. Goldbeck prepared the article on the water-ratio specification which appeared in the June-July issue of *The Crushed Stone Journal*, he submitted to Mr. McMillan, the author of the specification, a copy of his discussion asking him for his comments. Mr. McMillan has very kindly replied and we take pleasure in publishing the following letter:

PORTLAND CEMENT ASSOCIATION
33 West Grand Avenue
Chicago

July 28, 1927.

A. T. Goldbeck, Director, Bureau of Engineering
National Crushed Stone Association
651 Earle Building
Washington, D. C.

Dear Mr. Goldbeck:

I have read with interest your analysis of the water-ratio specification for concrete appearing in a recent issue of the *Crushed Stone Journal*.

While there are some points which have not been fully covered in your discussion of the water-cement ratio specification, in the main I am in full accord with your analysis. I think your paper is a very excellent contribution and should prove of inestimable value in the problem of improving the practice in concrete construction.

You are quite right in pointing out that the water-cement ratio strength relation is not a single one, but a series of such relations, each applying to a particular set of conditions. Your proposal for a series of preliminary tests to establish the water-cement-ratio-strength relation for each job is a logical one, and one that we have always advocated when it is possible to do so and facilities are available.

You are also quite right in pointing out the importance of

temperature as a factor in the quality of concrete. The proposal, which you suggest for taking this into account, seems to be a logical one and would be an important addition to any specification for the quality of concrete.

If you will recall the purpose of the water-cement ratio specification, I believe you will agree that it is hardly fair to ask of this specification that it solve all the problems attending concrete construction. The purpose of the water-ratio specification was to do away with the antiquated and unscientific methods of proportioning concrete solely on the basis of arbitrary mixes with no control over the proportion of water to cement, which has for a long time been recognized as the principal factor in the proportioning of concrete materials. Recognizing as we do that different materials show different water-cement-ratio-strength relations, we are still much nearer a proper solution of the problem through the specification of the water-cement ratio than by any arbitrary mix. With the principal factor of the water-ratio recognized in the drawing of specifications, it is now possible to give attention to the other refinements which will tend to better and more economical use of the materials. The most obvious steps are pointed out in your discussion—the control of the temperature and the proper selection of materials.

Another point in regard to the water-ratio specification as used on the Portland Cement Association Building, with which I think you are in accord, but which is not covered in your analysis, is that it places in the hands of the users of cement on small construction, where tests are out of the question, a very much safer criterion for the use of the available materials than was ever possible by any specification heretofore suggested. Working under this specification, a great variety of concrete construction can be safely carried out where laboratory facilities are not available and with greater economy than would be possible with any other method so far suggested.

Another advantage for the water-ratio specification, which was not brought out in your analysis, is illustrated in Fig. 4, giving the results from the Portland Cement Association Building tests. The comment you make that it would be possible to draw a specification, giving better control than illustrated here, is very true, but in doing so, it would have been necessary to have made restrictions on the work, which would have added to the cost without offering any advantage in the minimum strengths obtained. True, there would have been a more nearly uniform product throughout the work and a saving in cement quantity, but this would have been achieved at the expense of more elaborate equipment and expensive manipulation. In this way, the specification leaves open to the contractor, the selection of methods and materials which give the greatest total economy for the particular job—higher plant charges are avoided by a slight increase in cement factor to take care of the fluctuations through less accurate water control.

I believe that if you can call attention to these few points in connection with your analysis of the water-cement ratio specification, it will add greatly to its value for the man seeking help in his specification problems. With these few comments on the minor aspects of the problem, I want to again add my endorsement to your position on the major features—the use of the job curve and control of the temperatures.

Yours very truly,

F. R. McMILLAN,
Director of Research.

Effective Rock-Dusting of Coal Mines¹

By GEORGE S. RICE, *Chief Mining Engineer,*
Bureau of Mines, Department of Commerce

Bureau of Mines Policy on Rock-Dusting

"To prevent the propagation of mine explosions, the Bureau of Mines, Department of Commerce, recommends rock-dusting all coal mines, except anthracite mines, in every part, whether in damp or dry condition. It also recommends that rock-dust barriers be used to sectionalize the mine as additional defense; but these should not be regarded as a substitute for generalized rock-dusting." (Mine safety decision, No. 5, April 7, 1927.)

Purposes of This Circular

The purposes of this circular are to present concisely the requirements for effective rock-dusting of coal mines in order to prevent propagation of mine explosions, and to point out the principal related facts on explosibility of coal dusts and mixed coal-mine dusts, as determined by extensive testing in the Experimental Mine of the Bureau of Mines. Study of these principal facts on coal-dust explosibility in conjunction with the recommendations for rock-dusting, should help to make clear to mine operators and others concerned the necessity for systematic rock-dusting in all coal mines except anthracite mines, and the futility of inadequate or sporadic rock-dusting.

The descriptions of nearly 1000 explosion tests in the Experimental Mine are available in a forth-coming bulletin² and in earlier publications.³

For detailed specifications as to the kind of rock-dust, amount to use, where to be applied, and method of sampling and testing, the reader is referred to Bureau of Mines Serial 2606⁴, and American Engineering Standards Committee "Recommended American Practice for Rock-Dusting Coal Mines" quoted in Bureau of Mines Information Circular No. 6030⁵.

Summary of Specifications for Rock-Dusting

1. Mines to be rock-dusted.—All coal mines, except anthracite mines, should be rock-dusted.
2. Extent of rock-dusting.—All open accessible parts of a coal mine should be rock-dusted, including slopes, entries, cross-cuts, and rooms, headings and pillar workings to within at least 50 feet of the face.

3. Amount of rock-dusting.—After cleaning up the coal dust as thoroughly as practicable, sufficient rock-dust should be used to have the mixture of remaining coal-dust plus the rock-dust in any zone contain 65 per cent or more of inert or noncombustible matter. First dusting may require 3 pounds to 5 pounds per linear foot of passageway.
4. When to rock-dust.—In any zone or section (made by dividing the mine for rock-dusting purposes) when the incombustible content falls to 55 per cent, that section should be re-rock-dusted so as to bring the incombustible content well above 65 per cent.
5. Kind of rock-dust.—An incombustible dust, which is not unduly absorbent of moisture or which does not have a tendency to pack, should be used. Rock-dust for generalized dusting should not contain more than 25 per cent free silica. This provision is not essential for barriers, for which purpose a non-moisture absorbing non-packing dust is particularly advisable. Rock-dust should not contain more than two or three per cent of combustible material.

Limestone and dolomite dusts are preferential rock-dusting material, as they are free from silica and are whitish in color. Their light color is in great contrast to the blackness of coal dust, and discloses to the eye when there are dangerous accumulations of coal dust. A further advantage of light color is the aid to illumination.

6. Size of rock-dust.—It should all pass through a 20-mesh sieve and at least 50 per cent through a 200-mesh sieve.

¹From Information Circular No. 6039, Department of Commerce, Bureau of Mines, issued June, 1927.

²Rice, G. S., Paul, J. W., and Greenwald, H. P., Coal-dust explosion tests in the Experimental Mine, 1919 to 1924, inc. Bulletin 268, Bureau of Mines, 176 pp. (In press).

³Rice, G. S., and others. Coal-dust explosion tests in the Experimental Mine, first series, Bulletin 56, 1913, 115 pp; second series, 1913-1918, inc., Bulletin 167, 1922, 639 pp.

⁴Rice, G. S., Paul, J. W., and Sayers, R. R., Tentative specifications for rock-dusting to prevent coal-mine explosions. May, 1924. Reports of Investigations, Serial No. 2606, Bureau of Mines, May, 1924.

⁵Rice, G. S., Sayers, R. R., and Harrington, D., Rock-dusting in coal mines, Information Circular No. 6030, Bureau of Mines, March, 1927.

7. Sampling of rock-dust in defined zones of the mine should be done systematically and regularly. A minimum of 20 samples should be gathered monthly in a mine of small size and more samples in larger mines. It is recommended that at least one sample for each 1,000 tons of coal produced should be taken.
8. Determinations of the noncombustible content may be made by the Bureau of Mines "volumeter" checked by occasional chemical analysis.
9. Records of analyses or determinations in specified zones should be made in a book kept for the purpose and the times of re-rock-dusting each zone. Maps for rock-dusting purposes should be maintained and posted in the mine office and in fire-bosses' "shanties" underground, and these maps should also show the rock-dust zones and rock-dust barriers.
10. Rock-dust barriers should be used in order to confine to the zone or section where it originates, any incipient explosion that might be started, either from failure to maintain sufficiently the rock-dusting in that zone, or from ignition of an accumulation of gas. Rock-dust barriers are not equivalent to generalized rock-dusting and are regarded by the Bureau of Mines as secondary defenses. It is easier to prevent by general rock-dusting the starting of a coal-dust explosion than it is to stop an explosion by barriers.

An explanation of what is meant by rock-dust barriers follows:

Rock-Dust Barriers

"Rock-dust barriers" are devices for limiting the propagation of an explosion of coal-dust. They are shelves, movable or fixed, or closed containers generally extending across and being close to the roof of a passageway, and loaded with sufficient rock-dust to extinguish the flame of a dust explosion and capable of quick discharge of contents. Testing has shown that to be successful they must discharge and scatter from 50 to 100 pounds of rock-dust per square foot of cross-section of the passageway into the air immediately before the arrival of the flame.

Barriers might be designed to discharge by an electric circuit established by the melting of a foil device placed at a distance inby and outby the barrier, but for simplicity barriers so far devised rely on the air pressure waves immediately preceding the flame of explosive combustion of the coal-dust for their operation. As is the case in distributed rock-dust, the

particles of barrier rock-dust absorb the heat of burning coal-dust adjacent particles and, by interposition between particles of coal-dust, screen from the effect of radiant heat. Rock-dust barriers so far devised will not extinguish gas-air explosions.

Many types of "barriers" have failed in the Experimental Mine when tested, because:

- (a) The rock-dust has not been discharged quickly enough, before the arrival of flame.
- (b) There is not sufficient rock-dust discharged into the air.
- (c) The rock-dust has been discharged en masse, which is especially liable to occur if the rock-dust is so damp that it sticks together. Inert dust or rock-dust that absorbs moisture quickly should not be used. Where the location in the mine is moist, inclosed barriers are advisable.

Some types of barriers have been successful in tests in the Experimental Mine under various conditions. The reports of earlier testing have been given in detail in Bureau of Mines Bulletin 167. Work of development and testing of barriers is being continued at the Experimental Mine. It is not expected that barriers will be successful under all the varied conditions found in mine explosions and in any case explosions between barriers may and have caused loss of life, where the dependence has been solely on barriers; hence it is advisable to use them as secondary defenses in these positions:

- (a) At the mouths of principal branch entries;
- (b) At all openings to panels;
- (c) At approximately quarter-mile intervals on main entries;
- (d) At the ends and connections of passages which do not have tracks, but are needed for ventilation or travel, and therefore can not be sealed off by strong fireproof stoppings, as is recommended by the Bureau of Mines for all abandoned or unused places.

Relative Explosibility of Coal-Dusts

Intensive investigations in the Experimental Mine of the Bureau of Mines have determined these principal facts regarding the relative explosibility of coal-dust and mixed coal-mine dusts:

All coal-dusts, except anthracite dusts, if in a sufficiently dense cloud in air may be ignited by a flame or electric spark and may produce a violent explosion.

"Explosive" coal-dust is of a size that will pass through a 20-mesh sieve, so the maximum diameter

of the particle is about 1/30th of an inch. The mine-dusts in semi-anthracite, semi-bituminous, bituminous, and sub-bituminous mines differ in explosibility according to five factors:

1. Percentage of noncombustible in the dust as found.

2. Percentage of external water mixed with the mine dust.

3. Percentage of fine coal-dust in the mixture. That passing through a 200-mesh sieve is used as a measure of fineness.

4. Percentage of volatile matter in the combustible content of the dust, more commonly known as the volatile ratio.

5. Percentage of inflammable gas in the mine air.

Considering these five factors separately:

1. Percentage of noncombustible.—A mine dust, to prevent its propagating an explosion (no fire damp being present), must contain from about 20 per cent, in the case of a low-volatile or semi-anthracite dust, to 75 per cent noncombustible in the case of a high-volatile very fine size of coal-dust. In samples of mine dust it is impossible to distinguish between the ash of the coal-dust and the inert dust mixed with it by natural agencies. External ashy material or rock-dust has greater effect in absorbing heat than the inherent ash of the coal but it is not practical to separate in sampling.
2. Percentage of external water.—Small percentages of external or free moisture, that is, not inherent in the coal as water of composition or held in pores, has the practical effect on explosibility of dust projected into the air of so much incombustible, but in larger proportion there is a physical effect of causing the dust to adhere together or to stick to the floor, ribs, and timbering so that the dust will not be capable of being raised by air waves into the air as a dust cloud and propagation of an explosion will not occur in that place. If, however, fine inflammable dust is carried along by the advance air waves in sufficient amount, the explosion may be propagated through a wet zone. The percentage of free moisture in the mixed dust that will prevent it rising as a dust cloud at the inception of an explosion, varies from 15 per cent for coarse dust to 30 per cent for the finest sized dust.

The method of wetting coal-dust to prevent propagation of an explosion has failed because of the rapid drying of the coal-dust. Humidifying the intake has also failed because high relative

humidity or even saturation of the mine air does not prevent an explosion from propagating in coal dust.

Watering at the face, however, and the use of sprays on cutter bars of mining machines, also sprinkling the tops of loaded cars, lessens the distribution of dry coal-dust and hence less frequent rock-dusting is required.

3. Percentage of fine coal dust.—The finer the size of coal-dust in air, the more explosive it is. The criterion of fineness used by the Bureau of Mines is the percentage of dust passing through a 200-mesh sieve. A coarse mine dust, say 10 per cent passing through 200-mesh, may require, for an explosive dust like the Pittsburgh bed coal-dust, 50 per cent incombustible to render it harmless; whereas, a fine size of such dust may require 75 per cent incombustible.

Most untreated mine dusts from top, sides, and floor, it is found from sampling hundreds of mines, average in size 20 per cent through 200-mesh. Rib and timber dust samples, however, are usually much finer and if there are considerable amounts containing over 5 or 6 ounces of pure coal-dust per linear foot of passageway, then an increase of incombustible may be needed to prevent propagation of an explosion up to the percentage required for the fine (pulverized) coal-dust of the specific kind.

It has been demonstrated by tests that a coal-dust explosion may be propagated by timber and rib dust containing a large proportion of pure coal-dust, even if the bottom or floor dust is not an explosive mixture and the reverse is also true that a floor dust rich in coal-dust may propagate an explosion, although the ribs and timber have been rock-dusted, unless the cross timbers are so laden with rock-dust as to act like rock-dust barriers. Hence the necessity of sampling separately dust from the timbers and ribs from dust on the floor of mine workings, to determine when there is need of cleaning and of re-rock-dusting.

4. Percentage of volatile combustible matter.—The percentage that the volatile combustible matter is of the total combustible (commonly spoken of as the volatile ratio) is a most important factor in comparing the explosibility of mine dusts of different composition. The Bureau of Mines uses as a measure of this factor, the per cent of incombustible in a dust (ash plus moisture) which will just prevent propagation of an explosion by a

specific coal dust. The limiting percentage varies from 20 per cent incombustible, to render a semi-anthracite non-explosive to 75 per cent for high-volatile coal dust of the finest size. With coarser dust, such as most often found in mines, 20 per cent through 200-mesh, the requirement, when no appreciable amount of fire damp is present, is about 65 per cent (ash plus moisture) for an average high-volatile coal dust.

5. Percentage of inflammable gas.—The effect of methane in air below the lower explosive limit of the methane-air mixture, about 5.2 per cent, is that, to prevent propagation, an increase of incombustible in the dust is required in direct proportion to the percentage of methane. The increase varies from 3 per cent incombustible in case of the finest size of high-volatile coal-dust, to 10 per cent for dusts of low-volatile coals, which without any methane present have a low order of explosibility.

Conclusion

From a study of the foregoing factors in the relative explosibility of different coal dusts, it is evident that while each of the different factors has a wide range of values and some combine to increase while others tend to decrease explosibility of a given mine dust, the only safe procedure in the preventing of disastrous explosions is to rock dust thoroughly in every accessible part of a mine. Re-rock-dust immediately when the content of either floor dust or rib and timber dust falls to 55 per cent in any zone in the mine and maintain at all times the average noncombustible content of the mine dust above 65 per cent.

ROCK-DUSTING PROVES EFFECTIVE IN ENGLAND AND FRANCE

HUNDREDS of lives lost in the United States each year in coal-mine explosions could be saved. Figures proving this have just been compiled by the U. S. Bureau of Mines.

For 10 years French law has required rock-dusting in coal mines, and for 10 years no explosion disasters have occurred in French mines.

For six years Great Britain has required rock-dusting in coal mines, and for six years no major explosions have occurred in these mines except the recent New South Wales disaster, which would have been far more terrible had it not been for rock-dusting, the government inspector reported.

For two years rock-dusting has been tried voluntarily in a number of mines in the United States.

In this time there have been 10 major explosions in mines that were not rock-dusted or only partially so. There have been seven explosions of a limited character in rock-dusted mines.

In the mines where this safety device was not used only 60 per cent of the men in the works at the time of disaster escaped alive.

In the rock-dusted mines 97 per cent of those working when the limited explosions occurred escaped alive.

Since Jan. 1, 1926, 438 men have been killed in mines in the United States.

Rock-dusting is not excessively expensive, the Bureau of Mines has found. Its cost is no greater than that of accident insurance premiums.

ROMAN ROADS AND AMERICAN FEDERAL AID SYSTEM

IN THE past quarter century there has been a greater revival of interest in highway construction than has occurred since the building of the Appian Way 2000 years ago. Rome is credited with the finest roads of history, some of which are still in existence.

Contemplating the past, it is interesting to contrast the methods and the motives of the Romans, in their highway activity, with the methods and motives back of the highway construction of today. Rome built roads to hold her empire together—by force.

She built roads in order that troops might be moved quickly to points where insurrections from within, or invasion from without, threatened the stability of the government and the prestige of the empire.

Americans in the building of the great federal aid system, which today covers the country, seek to cement together a nation and an empire—but not by the use of force.

Americans realize that wide-spread familiarity with the many sections of the country will result in understanding, appreciation and the establishment of unity. It is to be hoped that troops will never move over the great highways, stretching from coast to coast, to subdue either internal uprisings or repel invasions. But the fellowship of the man in New York and the man in San Francisco will be strengthened and the nation as a whole knitted closer, when, from the Atlantic to the Pacific, "the twain have met" and have learned to know and understand each other. Without good roads this will not be possible.

Americans, however, because of the difference in motives, are building a more unified and permanent empire by good roads than ever was accomplished by the Romans.—*California Highways*.

Shippers of Crushed Stone and Chatts Hold Joint Conference with Carriers

*Reported by E. J. KRAUSE, Chairman
Special Traffic Committee, N. C. S. A.*

A JOINT conference of railroad representatives, members of the Traffic Committee of the Midwest Division of the National Crushed Stone Association and shippers of chatts in southeastern Missouri was held in the conference room of the Southwestern Freight Committee, Century Building, St. Louis, on June 9th with the following shippers and carriers in attendance:

C. K. Stroube, G. S. Robins & Company; E. G. Bringhurst, G. S. Robins & Company; F. C. Murphy, Electric Limestone Co.; J. E. Brouhard, St. Joseph Lead Co.; B. W. LaTourette, M. R. & B. T. Railway; D. W. Longstreet, Traffic Manager, Illinois Central Railroad; H. P. Cormick, Louisville and Nashville Railroad; C. Anderson, Mobile & Ohio Railroad; G. C. Schmoll, Southern Railway; Jas. P. Flannery, P. Flannery & Sons; A. H. Bannister, Brownell Improvement Co.; F. P. Sackbauer, Missouri-Illinois Railroad and M. R. & B. T. Railway; F. E. Webster (by J. Cibulka), Chicago & East Illinois Railroad; W. T. Stevenson (by P. J. Zimmer), Cleveland, Cincinnati, Chicago & St. Louis Railroad; E. J. McMahon, Exec. Sec'y, St. Louis Quarrymen's Ass'n; H. G. Wilson, Traffic Manager, Columbia Quarry Co.; E. J. Krause, Pres., Columbia Quarry Co., Chairman, Traffic Committee, National Crushed Stone Ass'n; W. R. Sanborn, Vice-Pres., Lehigh Stone Co.; J. E. Weber, Casper Stolle Quarry & Contracting Co.; Wm. J. Lahr, Assistant General Freight Agent, Chicago, Burlington & Quincy Railroad Co.; D. R. Lincoln, Assistant Freight Traffic Manager, Missouri Pacific Railroad Co.

W. R. Sanborn was elected Chairman of the meeting and after a brief discussion pointed out that the main purpose of the conference was for a discussion of the present rate adjustment on chatt carloads from M. R. & B. T. origin points to Illinois, particularly to that destination territory on and south of the Baltimore and Ohio Railroad.

The Limestone Traffic Committee had carefully analyzed the rate situation (chatts vs. limestone) and for the information of those present read the letter of March 30th which this Committee addressed to Mr. F. B. Bowes, Vice-President of the Illinois Central System at Chicago, Illinois. The numerous rate ex-

hibits which accompanied this letter were then briefly referred to.

A general discussion next took place, making it apparent that before any definite conclusions could be reached it would be necessary for the carriers to have opportunity to go more thoroughly into the situation.

It was then decided that two committees, consisting of five members each, should be appointed by the shippers and carriers respectively to further study this question with a view to working out some tangible rate adjustment.

Mr. Longstreet, Traffic Manager for the Illinois Central Railroad, appointed as the carriers' committee the Illinois Central, the Chicago & East Illinois, the Mobile and Ohio, the Missouri-Illinois, and the Missouri Pacific Railroads, Mr. Longstreet to act as Chairman and the personnel to be announced later. Mr. Sanborn appointed as the shipper's committee—H. G. Wilson, Chairman; C. A. Jones, E. J. McMahon, W. J. Warner and J. E. Brouhard, Mr. Brouhard to act as the representative of the chatts producers.

These two committees will hold individual and joint meetings as often as necessary in an effort to adjust this rate situation.

The meeting then adjourned.

RESISTANCE OF STONE TO FROST IS STUDIED

EXPERIMENTS to determine the relative resistance of various types and deposits of stone to frost action are now being conducted, according to a statement of the Bureau of Standards. The results of these tests on the durability of stone will be of particular value in building monuments and structures designed to endure for centuries.

The full text of the statement follows:

In this country there are few stone structures which are more than 100 years old. Considering the types of stone so extensively utilized at the present time there are few structures built of them which have stood for a period greater than 50 years. While actual examples of stone structures which have stood for long periods are of the greatest value in estimating

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The Crushed Stone Journal

J. R. BOYD, Editor

A. T. GOLDBECK, Director, Bureau of Engineering

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The entire industry will be shocked to learn of the sudden death by drowning of W. L. Hodgekins, President of the Brownell Improvement Company of Chicago.

While Mr. Hodgekins and some friends were on board a launch on Georgia Bay, near Winnipeg, fire suddenly broke out, causing all to jump. Mr. Hodgekins, after heroically saving the lives of two of his guests and two members of the crew, went back after two additional members of the crew who were in distress. Although an expert swimmer, this task proved too much for his endurance and all three were drowned.

We wish to extend our sincere and heartfelt sympathy to his business associates and to the members of his family in their bereavement.

Low Cost Improvement of Earth Roads with Crushed Stone

IN LINE with the policy of the Association to issue, about once a month, through the Bureau of Engineering, semi-technical bulletins dealing with fundamental subjects of interest and value to the users and producers of crushed stone, Bulletin No. 2 has recently come from the press and been distributed to our membership.

The subject of this Bulletin, "Low Cost Improvement of Earth Roads With Crushed Stone," should make a distinct appeal, pointing out as it does a practical and

economical method of constructing low cost secondary roads. When placed in the hands of state, county, township and municipal highway officials, it should do much to stimulate interest in this type of construction.

We earnestly suggest that all member companies who have not as yet placed their orders for Bulletin No. 2 immediately send them in to the Washington Office.

BELSHAZZAR AND THE EXPERT

DR. ARTHUR D. LITTLE, who was President of the American Chemical Society before the war and who did all sorts of scientifically useful things during it, lately made an address in which he had a good word to say for Belshazzar. He "deserved what he got," but this is to be said for him, that he called in an expert to give him advice when his thoughts troubled him because of the handwriting on the wall which his own soothsaying accountants could not interpret. It is to the credit of Belshazzar that he paid the bill of the prophetic expert even though Daniel showed that this proud son of Nebuchadnezzar was insolvent and prophesied unequivocally that his kingdom was "finished." The advice came too late. Belshazzar was slain that night. Darius, the Median, took over the business, and after setting 120 satraps over the kingdom installed over them three presidents, to whom the satraps should give accounts that "the King should have no damage," one of the presidents being Daniel, the expert.

The scientist took his text from the Book of Daniel to suggest to the modern executive the importance of calling in the expert before the balance is hopelessly against the business—so late that even the expert cannot avert that sentence which may look as but a "mural decoration." Definitions of an expert, current in after-dinner speeches, as "one who knows more and more about less and less" or as "one who doesn't know anything else," will not relieve us of the need of those who really do know everything that is known about something.

It is not enough that scientists should be educated to meet their responsibilities. The manufacturer and the inventor need to be taught the perils which lie before companies that ignore research. The handwriting on the wall, as the chemist interprets it, reads, "The price of progress is research, which alone assures the security of dividends." But for most business it is a warning and not a doom, as was the writing "over against the candlestick upon the wall" of the banquet hall of Belshazzar. An unheeded warning becomes a doom.—*New York Times*.

RESISTANCE OF STONE TO FROST IS STUDIED*(Continued from page 9)*

the durability of any particular stone, short periods of use have only a relative value in this respect.

In order to gain more knowledge of the desirability of present-day building stone, this bureau is conducting experiments to determine the relative resistance to frost action of various types and deposits. Frost action tests, when carried to the point where the specimens are disintegrated, with many deposits of natural stone, require a considerable expenditure of time, and hence an important object of this research is to determine, if possible, a more simple means of predicting durability.

A comparison of the frost resistance of many samples of stone with the usual physical determinations, such as strength, elasticity, porosity, absorption or relation of absorption and porosity, shows that while such properties may have a bearing on the subject of durability they do not afford a thoroughly reliable criterion for judging this property.

A theory has been advanced that if a stone readily absorbs a volume of water greater than nine-tenths of its pore space it will not be resistant to frost action. This is based on the fact that water increases in volume by one-tenth in solidifying. The present research does not indicate that this theory is reliable. Considerable evidence has been developed that the relation of absorption to permeability is a valuable factor in predicting durability; that is, if the stone offers little resistance to the flow of water through its pores a high absorption may not be particularly undesirable.

A technologic paper will be available at an early date containing the results of frost action tests on the limestones of this country. Work is in progress on the commercial sandstones which will be made the subject of a similar report.

**SAFETY ORGANIZATION FOR THE
QUARRYING INDUSTRY**

THERE has just recently been published by the National Safety Council a pamphlet entitled, "Safety Organization for the Quarrying Industry" which is the result of the joint efforts of the Quarry Section of the National Safety Council and the Committee on Welfare and Safety of the National Crushed Stone Association.

This pamphlet outlines in a simple and concise manner the essentials of organizing for accident prevention

and yet fully covers the ground, both from the point of view of the large producer and the small producer.

We are all desirous of reducing accidents in the quarrying industry and here are definite recommendations as to the best means of accomplishing that end. Let us show our Committee on Welfare and Safety that we are earnestly and conscientiously endeavoring to cooperate with them in promoting safety by putting into practice the recommendations which have been made.

To the authors of this pamphlet we wish to extend our congratulations in contributing such an excellent addition to the literature on accident prevention in the quarrying industry.

It is our understanding that copies have been sent to every crushed stone producer in the country, but in the event that you have not received one, they may be obtained by writing to the National Safety Council, 108 East Ohio Street, Chicago, Illinois.

PRODUCTION COSTS OF BROKEN STONE

THE United States Department of Agriculture has recently issued Miscellaneous Circular No. 93, Direct Production Costs of Broken Stone, By George E. Ladd, economic geologist, division of tests, Bureau of Public Roads. This circular contains a detailed report of cost analyses of operations at a number of quarries of various sizes, involving production of broken stone in various kinds of rock, and discusses generally the conditions which affect costs. The report describes in detail the character of each of the quarries studied and gives direct costs of the various operations, such as stripping, drilling face, breaking boulders by various methods, face blasting, etc. Some quarries, where methods of operation were changed after the studies were made, were studied during the following season in order to compare the two different methods of operation. Tables of detailed costs for each quarry are followed by tables and discussions analyzing each of the major operations for all the quarries studied. The bulletin will be of great value to quarry operators, engineers, and others having to do with the production of broken stone in determining if operations are being efficiently conducted by comparison with other quarries operating under similar conditions. It will also be useful in determining the efficiency of operations in rock excavation for highway and other purposes.

It is believed that its greatest usefulness lies in the suggestions it contains for producers who wish to adopt a cost-keeping system based on units of operation.

—Public Roads.

WEST BADEN SELECTED FOR 1928 CONVENTION*(Continued from page 2)*

mously that such a laboratory be established and that the officers of the Association take necessary steps towards the raising of the additional revenue required.

Safety Trophy Offered

We have long been aware of the sincere and earnest desire on the part of Mr. Greensfelder to promote safety throughout the crushed stone industry, and of his very valuable assistance along these lines, and now comes additional evidence of this in his offer to the Board of Directors, on behalf of The Explosives Engineer, to present to the Association a suitable safety trophy to be awarded each year to the member of the Association having the best record in the National Safety Competition. Mr. Greensfelder's generous

offer was immediately accepted with the sincere thanks of the Association.

Reports of the President, Treasurer, Director of the Bureau of Engineering and Secretary were heard and accepted.

It has not been the purpose of this article to give a detailed account of the meeting of the Board of Directors but more to direct attention to the more important of the matters which were considered.

Following is a list of those who were in attendance at the meeting:

O. M. Graves, H. E. Bair, W. W. Boxley, C. M. Doolittle, W. S. Eames, F. T. Gucker, J. C. King, E. J. Krause, A. S. Lane, Russell Rarey, John Rice, James Savage, F. W. Schmidt, Jr., W. L. Sporborg, J. W. Stull, W. F. Wise, A. L. Worthen, C. B. Andrews, N. S. Greensfelder, S. R. Russell, A. T. Goldbeck, J. R. Boyd, N. C. Rockwood, E. G. Lewis, and E. I. Wolf.

CHIPS

Boston's Traffic Jam

Motor Cop (to professor of mathematics)—"So you saw the accident, sir. What was the number of the car that knocked this man down?"

Professor—"I'm afraid I've forgotten it. But I remember noticing that if it were multiplied by fifty, the cube root of the product would be equal to the sum of the digits reversed."—*Boston Transcript*.

* * *

Big Ben

Errant Husbum—"Oh, no, wife, I got in at 1 o'clock."

Angry Wife—"I distinctly heard the clock strike five times."

Errant Husbum—"Did you hear it too? 'Sfunny thing; the clock struck one five times. Must get the blame thing fixed."—*Texas Highway Bulletin*.

* * *

Disobeyed

Lad—"Father, what makes the world go 'round?"

Dad—"Son, I've told you many times to keep out of the basement!"—*Texas Highway Bulletin*.

* * *

Objective Point

Porter: "This train goes to El Paso and points west."

Old Lady: "Well, I want a train that goes to Texas, and I don't care which way it points."—*Exchange*.

Her Choice

A woman shopper approached the postoffice clerk at the stamp window.

"I would like to look at your red two-cent stamps," she said.

The clerk obligingly brought out a sheet of 100 or more stamps. Pointing to one of the stamps in the center of the sheet, his discriminating customer sweetly said, "I'll take that one."—*Exchange*.

* * *

Porter—"How would you like to sleep—head first or feet first?"

Voyager—"If it's all the same to you, I'll sleep all at the same time."—*Bobcat*.

* * *

Fair one (to tourist who is shaving outside of his tent): "Do you always shave outside?"

Tourist: "Certainly! Do you think I'm fur-lined?"

—*Northwestern Purple Parrot*.

* * *

Coop or Coop-Pay?

Two colored gentlemen were talking about automobiles owned by their respective employers.

"An' den he bought dis new 'coop'."

"You don't call dem 'coops'; dey is pronounced 'coop-pay.' A 'coop' is what you put chickens in."

"Yes, sah; dat's what he does with dis one."

